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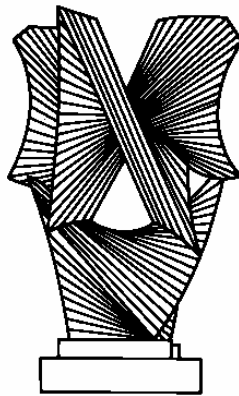
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CLIMATE CHANGE JUSTICE

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Climate Change Justice

Eric A. Posner* and Cass R. Sunstein**

***Abstract.** Greenhouse gas reductions would cost some nations much more than others, and benefit some nations far less than others. Significant reductions would impose especially large costs on the United States, and recent projections suggest that the United States has relatively less to lose from climate change. In these circumstances, what does justice require the United States to do? Many people believe that the United States is required to reduce its greenhouse gas emissions beyond the point that is justified by its own self-interest, simply because the United States is wealthy, and because the nations most at risk from climate change are poor. This argument from distributive justice is complemented by an argument from corrective justice: The existing “stock” of greenhouse gas emissions owes a great deal to the past actions of the United States, and many people think that the United States should do a great deal to reduce a problem for which it is largely responsible. But there are serious difficulties with both of these arguments. Redistribution from the United States to poor people in poor nations might well be desirable, but if so, expenditures on greenhouse gas reductions are a crude means of producing that redistribution: It would be much better to give cash payments directly to people who are now poor. The argument from corrective justice runs into the standard problems that arise when collectivities, such as nations, are treated as moral agents: Many people who have not acted wrongfully end up being forced to provide a remedy to many people who have not been victimized. The conclusion is that while a suitably designed climate change agreement is in the interest of the world, a widely held view is wrong: Arguments from distributive and corrective justice fail to provide strong justifications for imposing special obligations for greenhouse gas reductions on the United States. These arguments have general implications for thinking about both distributive justice and corrective justice arguments in the context of international law and international agreements.*

I. Introduction

The problem of climate change raises difficult issues of science, economics, and justice. While the scientific and economic issues have been analyzed in great deal,¹ the question of justice has received comparatively little attention.² Several points are clear. The United States long led the world in greenhouse gas emissions; China has surpassed the United States.³ The two leading emitters now account for about 40 percent of the world’s emissions, but they have independently refused to accept binding emissions

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¹ For an overview of both, see Nicholas Stern, *The Economics of Climate Change* (2007). On the economics, see William Nordhaus, *The Challenge of Global Warming: Economic Models and Environmental Policy* (2007), available at

http://www.econ.yale.edu/~nordhaus/DICEGAMS/dice_mss_060707_pub.pdf; for an overview of the science, see John Houghton, *Global Warming: The Complete Briefing* (3d ed. 2005).

² Valuable treatments include Dale Jamieson, *Adaptation, Mitigation, and Justice*, in *Perspective on Climate Change: Science, Economics, Politics, Ethics* 217 (Walter Sinnott-Armstrong and Richard Howarth eds. 2005); Julia Driver, *Ideal Decision Making and Green Virtues*, in *id.* at 249. Some of the ethical issues are also engaged in Stern, *supra* note.

³ See *infra*.

limitations, apparently because of a belief that the domestic costs of such limitations would exceed the benefits.⁴

The emissions of the United States and China threaten to impose serious losses on other nations and regions, including Europe but above all India and Africa.⁵ For this reason, it is tempting to argue that both nations are, in a sense, engaging in tortious acts against those nations that are most vulnerable to climate change. This argument might seem to have special force as applied to the actions of the United States. While the emissions of the United States are growing relatively slowly, that nation remains by far the largest contributor to the existing “stock” of greenhouse gases. Because of its past contributions, does the United States owe compensation to those nations, or those citizens, most likely to be harmed by climate change? Principles of corrective justice might seem to require that the largest emitting nation pay damages to those who are hurt⁶ – and that they scale back their emissions as well.

Questions of corrective justice are entangled with questions of distributive justice. The United States has the highest Gross Domestic Product of any nation in the world, and its wealth might suggest that it has a special duty to help to reduce the damage associated with climate change. Are the obligations of comparatively poor China, the leading emitter, equivalent to those of the comparatively rich United States, the second-leading emitter? Does it not matter that China’s per capita emissions remain a mere fraction of that of the United States? Perhaps most important: Because of its wealth, should the United States be willing to sign an agreement that is optimal for the world as a whole – but not optimal for the United States?

In this Article, we attempt to make progress on these questions, in a way that is designed to cast light on some important conundrums in the domain of climate change and also in international law more generally. To motivate the analysis, and to put the issues of justice in their starkest form, we start with two admittedly controversial assumptions. First, the world, taken as a whole, would benefit from an agreement to reduce greenhouse gas emissions.⁷ This assumption is reasonable because increasing evidence suggests that the global benefits of imaginable steps – such as a modest carbon tax, growing over time⁸ – are significantly larger than the global costs.⁹ Second, some nations, above all the United States (and very possibly China as well), would not benefit, on net, from an agreement that would be optimal from the world’s point of view.¹⁰

⁴ See Scott Barrett, *Environment & Statecraft* (2004), for a good overview of the American position, with particular reference to the Kyoto Protocol; see National Development and Reform Commission, *People’s Republic of China, China’s National Climate Change Programme* (June 2007), for an overview of the Chinese position.

⁵ See William Nordhaus and Joseph Boyer, *Warming the World* 91 (2000).

⁶ See, e.g., Jagdish Bhagwati, *Global Warming Fund Could Succeed Where Kyoto Failed*, *Financial Times* (Aug. 16, 2006).

⁷ See Nordhaus, *supra* note, at 15; Stern, *supra* note.

⁸ See Nordhaus, *supra* note, at 11.

⁹ See *id.*; Bjorn Lomborg, *Cool It* (2007) (suggesting a \$2 per ton carbon tax).

¹⁰ On the plausibility of this assumption, see Cass R. Sunstein, *The Complex Climate Change Incentives of the China and the United States* (unpublished manuscript 2007).

Suppose, for example, that the world settled on a specified carbon tax – say, \$20 per ton. Such a tax would be likely to impose especially significant costs on the United States, simply because its per capita emissions rate is so high.¹¹ Suppose, finally, that the United States is not as vulnerable as many other nations to serious losses from climate change, and that the expected damage, in terms of health, agriculture, and more, is comparatively low – and that in those terms other nations, such as India and those in Sub-Saharan Africa, are likely to lose much more.¹² If so, the United States might be a net loser from a specified worldwide carbon tax even if the world gains a great deal. Perhaps the optimal carbon tax, for the world, would be \$20 per ton, but the United States would do better with a worldwide carbon tax of \$5 per ton, or \$1 per ton, or even \$0 per ton.

We have said that both assumptions are controversial, and we are aware that they might be questioned. In particular, many people think that the domestic cost-benefit analysis for the United States does justify participation in an international agreement, and such people may well believe that the optimal agreement for the world is close to the optimal agreement for the United States.¹³ But even if this is so, it remains important to specify the content of that agreement. Suppose, as seems clear, that India and Africa would gain a great deal from an agreement, whereas the United States would gain a much lower amount. What, if anything, does this point suggest about the proper content of the agreement?

Let us assume, most starkly, that the United States would lose, on net, from a climate change agreement that is optimal from the standpoint of the world taken as a whole. If so, the standard analysis of the problem is clear: The world should enter into the optimal agreement, and the United States should be given side-payments in return for its participation.¹⁴ The reason for this conclusion is straightforward. The optimal agreement should be assessed by reference to the overall benefits and costs¹⁵ of the relevant commitments for the world. To the extent that the United States is a net loser, the world should act so as to induce it to participate in an agreement that would promote the welfare of the world's citizens, taken as a whole. With side-payments to the United States, of the

¹¹ See *infra*. Note that carbon dioxide is not the only greenhouse gas, and so a carbon tax would be only a partial solution. For expository clarity, however, we will focus on carbon taxes and similar regimes.

¹² See Nordhaus and Boyer, *supra* note, at 91. Broadly in accord is Richard Tol, *Estimates of the Damage Costs of Climate Change*, 21 *Environmental and Resource Economics* 135 (2002).

¹³ See Richard Stewart and Jonathan Wiener, *Reconstructing Climate Policy: Beyond Kyoto* 49-53 (2003), suggesting that participation by the United States is in that nation's interest and suggesting steps that might make participation worthwhile for China as well. For a recent study, arguing for significant steps for the United States and suggesting significant losses for a large part of the United States, see Peter Frumhoff et al., *Confronting Climate Change in the U.S. Northeast* (July 2007), available at <http://www.climatechoices.org/assets/documents/climatechoices/confronting-climate-change-in-the-u-s-northeast.pdf>

¹⁴ Side-payments might take various forms, as we shall see; one possibility would be cash, whereas another would be initial allocations under a cap-and-trade program, see Stewart and Wiener, *supra* note, at 15.

¹⁵ We are not contending that benefits and costs should be understood in purely monetary terms, nor are we saying anything contentious about what benefit-cost analysis should entail. For general discussion, see Matthew Adler and Eric A. Posner, *New Foundations for Cost-Benefit Analysis* (2005).

kind that have elsewhere induced reluctant nations to join environmental treaties,¹⁶ an international agreement could be designed so as to make everyone better off and no one worse off. Who could oppose such an agreement?

Our puzzle is that almost everyone does so. No one is suggesting that the world should offer side-payments to the United States. One reason involves distributive justice. The United States is the richest nation in the world, and many people would find it preposterous to suggest that the world's richest nation should receive compensation for helping to solve a problem faced by the world as a whole, and above all by poor nations.¹⁷ On this view, wealthy nations should be expected to contribute a great deal to solving the climate change problem; side-payments would be perverse. If ideas of distributive justice are at work, it might be far more plausible to suggest that nations should pay China for agreeing to participate in a climate change agreement. And indeed, developing nations, including China, were given financial assistance as an inducement to reduce their emissions of ozone-depleting chemicals.¹⁸ Some people think that a climate change agreement should build on this precedent¹⁹; no one thinks that assistance to the United States, or to other wealthy countries, is in order.

But claims about distributive justice are only part of the story here. Corrective justice matters as well.²⁰ The basic thought is that the largest emitters, above all the United States, have imposed serious risks on other nations. Surely it cannot be right for nations to request payments in return for ceasing to harm others. On the conventional view, wrongdoers should pay for the damage that they have caused and should be asked to stop. They should not be compensated for taking corrective action.

We shall raise serious questions about both accounts here. We accept the view that in many domains, resources should be redistributed from rich nations and rich people to poor nations and poor people.²¹ But significant greenhouse gas reductions are a crude and somewhat puzzling way of attempting to achieve redistributive goals. The arc of human history shows that in the future, people are likely to be much wealthier than

¹⁶ Thus, for example, Russia and Eastern Europe were given emissions rights worth billions of dollars in the Kyoto Protocol. See Nordhaus and Boyer, *supra* note, at 162. Significant side-payments were given to poor nations in connection with the Montreal Protocol. See Scott Barrett, *Environment & Statecraft* 346-49 (2004). See the general treatment of the "Side Payments Game" in *id.* at 335-51.

¹⁷ In the exhaustive analysis in *Stern Review*, *supra* note, for example, there is no suggestion of side-payments to the United States. The dominant view among philosophers is decidedly to the contrary. See, e.g., Henry Shue, *Subsistence Emissions and Luxury Emissions*, 15 *Law & Pol'y* 39 (1993); Peter Singer, *One World* (2002).

¹⁸ See Cass R. Sunstein, *Of Montreal and Kyoto: A Tale of Two Protocols*, 31 *Harv Env L Rev* 1, 16-17 (2007). For other examples of side payments in environmental treaties, see Mark A. Drumbl, *Northern Economic Obligation, Southern Moral Entitlement and International Environmental Governance*, 27 *Colum. J. Envtl. L.* 363 (2002).

¹⁹ Sheila Olmstead and Robert N. Stavins, *A Meaningful Second Commitment Period for the Kyoto Protocol*, *The Economists' Voice* (May 2007), available at www.bepress.com/ev.

²⁰ See, e.g., Daniel Farber, *Adapting to Climate Change: Who Should Pay*, *U Pa L Rev* (forthcoming 2007).

²¹ See Eric A. Posner, *International Law: A Welfarist Approach*, 73 *U. Chi. L. Rev.* 487 (2006).

people are now.²² Why should the wealthy countries give money to future poor people, rather than to current poor people? (Current emissions reductions will generally fail to help current poor people, simply because the effects of such reductions will not be felt for many years.) In any case, nations are not people; they are collections of people. Redistribution from wealthy countries to poor countries is not the same as redistribution from wealthy people to poor people. For one thing, many poor people in some countries will benefit from global warming, to the extent that agricultural productivity will increase²³ and to the extent that they will suffer less from extremes of cold.²⁴ For another thing, poor people in wealthy countries may well pay a large part of the bill for emissions reductions.

The upshot is that if wealthy people in wealthy nations want to help poor people in poor nations, emissions reductions are far from the best means by which they might to do so. Our puzzle, then, is why distributive justice is taken to require wealthy nations to help poor ones in the context of climate change, when wealthy nations are not being asked to help poor ones in areas in which the argument for help is significantly stronger.

We also accept the view that when people in one nation wrongfully harm people in another nation, the wrongdoers have a moral obligation to provide a remedy to the victims. It might seem to follow that the largest emitters, and above all the United States, have a special obligation to remedy the harms they have caused, and certainly should not be given side-payments. But the application of standard principles of corrective justice to problems of climate change is, at best, extremely troublesome. As we shall show, corrective justice arguments in the domain of climate change raise many of the same problems as corrective justice arguments in the context of reparations more generally. Nations are not individuals: they do not have mental states and cannot, except metaphorically, act. Blame must ordinarily be apportioned to individuals, and it is hard to blame all greenhouse gas-emitters for wrongful behavior, especially those from the past who are most responsible for the current stock of greenhouse gases in the atmosphere.

Our minimal submissions are that the distributive justice argument must be separated from the corrective justice argument, and that once the two arguments are separated, both of them run into serious problems. If the United States wants to assist poor nations, reductions in greenhouse gas emissions are hardly the best way for it to accomplish that goal. It is true that many people in poor nations are at risk because of the actions of many people in the United States, but the idea of corrective justice does not easily justify any kind of transfer from contemporary Americans to people now or eventually living in (say) India and Africa.

This conclusion should not be misunderstood. We do not question the proposition that an international agreement to control greenhouse gases, with American participation,

²² See Remarks of Vernon Smith, in *Global Crises, Global Solutions* 630, 635 (Bjorn Lomborg ed. 2004); Remarks of Thomas Schelling, in *id.* at 627.

²³ See Nordhaus and Boyer, *supra* note, at 76 (showing benefits in China, Japan, and Russia).

²⁴ See Bjorn Lomborg, *Cool It* (2007).

is justified,²⁵ and all things considered, the United States should probably participate even if the domestic cost-benefit does not clearly justify such participation.²⁶ The reason is that if the United States is able to confer substantial benefits on the world as a whole, it should probably do so even if it would be a net loser, or even if it would gain more from an agreement of a different sort. If we care about social welfare, we should approve of a situation in which a wealthy nation is willing to engage in a degree of self-sacrifice when the world benefits more than that nation loses. Our goal here is not to question these propositions, but to show that contrary to widespread beliefs,²⁷ there are real problems in attempting to justify them by reference to distributive or corrective justice.²⁸

As we shall see, identification of those problems has general implications for thinking about distributive and corrective justice in the context of international law and international agreements. In many domains, distributive justice might seem to require wealthy nations to make special contributions.²⁹ Such nations might do well to pay their proportionate share or more, but it is important to see that other redistributive strategies might be much better for helping those who are most disadvantaged. Corrective justice arguments arise in many areas in which previous generations in one nation acted in a way that harmed or threatens to harm those in another nation.³⁰ Our argument suggests that if the goal is to act in accordance with corrective justice, it is important to identify both the actors and the victims; abstract references to nations as wrongdoers, and nations as victims, often beg or obscure the key questions.

The rest of this Article comes in three parts. Part II briefly outlines relevant facts about the climate change problem. Parts III and IV turn to the questions of distributive justice and corrective justice, respectively. Part V discusses the view, pressed by China in particular, that emissions rights should be allocated on a per capita basis. As we will see, this claim amounts to a plea for significant redistribution from wealthy countries, above all the United States, to poor countries, above all China and India.

²⁵ See Nordhaus, *supra* note, at 137. Notably, Bjorn Lomborg, *Cool It* (2007), a skeptical treatment of many arguments on behalf of greenhouse gas reductions, argues for a significant tax on carbon emissions. *Id.* at 153.

²⁶ See Stewart and Wiener, *supra* note, at 49-52.

²⁷ See, e.g., Jamieson, *supra* note.

²⁸ Among international lawyers, distributive justice and corrective justice ideas are invoked in favor of the principle of “common but differentiated responsibilities,” the idea that wealthier and more-at-fault nations should contribute disproportionately to the creation of international public goods. See Rio Declaration on Environment and Development, UN Doc. A/Conf. 151/5/Rev. 1 (1992), 31 ILM 874 (1992). For a valuable discussion, which touches on both the distributive justice and corrective justice problems with this view, see Christopher D. Stone, *Common But Differentiated Responsibility in International Law*, 98 Am. J. Int’l L. 276 (2004). See also Lavanya Rajamani, *Differential Treatment in International Environmental Law* (Oxford, 2006). We turn to the notion of common but differentiated responsibilities in Part IV.

²⁹ See the brief discussion of biodiversity in Barrett, *supra* note, at 350.

³⁰ See *infra*.

II. Ethically Relevant Facts

It is an understatement to say that there is a voluminous literature on the science and economics of climate change.³¹ We concentrate in this section on a review of those facts that are most relevant to the questions of justice, and that help establish the complex relationship between the interests of the world, taken as a whole, and the interests of the United States. As we shall see, different nations stand to gain and to lose significantly different amounts both from climate change and from greenhouse gas emissions reductions. Because it provides an illuminating comparison, with important implications for questions of justice, we shall draw attention to the situation of China as well.

A. In General

As we have noted, a strong consensus supports the view that the world would benefit from significant steps to control greenhouse gas emissions.³² If all of the major emitting nations agreed to such steps, the benefits would almost certainly exceed the costs.³³ To be sure, there is continuing disagreement about the appropriate timing and severity of emissions reductions.³⁴ But as compared to “business as usual,” much would be gained, and less lost, if modest reduction policies were adopted soon, followed by larger ones over time.³⁵

There is also a consensus that if the world does undertake an effort to reduce greenhouse gas emissions, it should select one of two possible approaches.³⁶ The first is an emissions tax, designed to capture the externalities associated with climate change. A worldwide tax on carbon emissions might start relatively low – at, say, \$10 per ton – and increase as technology advances.³⁷ On an approach of this kind, it is generally assumed that the tax would be uniform. Citizens of Russia, China, India, the United States, France, and so forth would all pay the same tax. There is a disagreement about the proper magnitude of the tax,³⁸ and as we shall see, different nations would gain and lose different amounts from any given tax.

³¹ See notes *supra*.

³² See notes *supra*.

³³ See Nordhaus, *supra* note, at 137 (claiming a \$3.4 trillion net present-value benefit of an “optimal” climate change policy).

³⁴ Compare Stern, *supra* note (arguing for aggressive, immediate restrictions), with Lomborg, *supra* note (arguing for modest carbon tax). Much of the disagreement between Stern on the one hand and those who favor a more modest approach stems from a difference over the appropriate discount rate; Stern’s conclusion is driven by a choice of a discount rate close to zero. See Nordhaus, *supra* note, at 108-109. For our purposes it is not necessary to explore the resulting debates. For discussion, see Symposium, *Intergenerational Equity and Discounting*, 74 U. Chi. L. Rev. 1 (2007).

³⁵ See Nordhaus, *supra* note, at 147. Diverse perspectives and vigorous debates can be found in the various contributions to Symposium, *Climate Change*, 7 *World Economics* vol. 4 (2006); Symposium, 8 *World Economics* vol. 1 (2007); Symposium, *Climate Change*, 8 *World Economics* vol. 2 (2007).

³⁶ See, e.g., Nordhaus, *supra* note (defending carbon tax).

³⁷ See *id.*; Lomborg, *supra* note, at 153 (suggesting a range of between two dollars and fourteen dollars per ton).

³⁸ See note *supra*.

The second approach would involve a system of cap-and-trade, akin to that in the Kyoto Protocol.³⁹ Under such a system, nations might create a worldwide “cap” on aggregate emissions – calling, say, for a 10 percent reduction from worldwide emissions in 2007, with further reductions over time. A cap-and-trade system would require a judgment about the appropriate cap and also an initial allocation of emissions rights. On one version, roughly embodied in the Kyoto Protocol, existing emissions levels would provide the foundation for initial allocations; nations would have to reduce by a certain percentage from those existing levels.⁴⁰ As we will see, the use of existing levels is highly controversial and in a sense arbitrary.⁴¹ But analytically, it is not very different from a uniform carbon tax; in both cases, current practices are the starting point for regulatory measures.

It is important to see that an agreement to control greenhouse gas emissions loses nearly all of its point if only a few nations are willing to participate. The Kyoto Protocol, for example, required most of the industrialized world to cut emissions significantly, but because developing nations refused to accept any emissions restrictions, a prominent study offers this stunning finding: Full compliance with the agreement would have reduced anticipated warming by merely 0.03 C by 2100.⁴² Consider the fact that the Intergovernmental Panel on Climate Change now provides a “best estimate” of warming ranging from 1.8 C to 4.0 C by 2100,⁴³ under a “business as usual” scenario. Not much would be gained if all nations complied with their Kyoto obligations and reduced those figures to a range of 1.77 C to 3.97 C.⁴⁴

A more optimistic estimate finds that the Kyoto Protocol might reduce global warming by as much as 0.28 C by 2100, and the difference between “business as usual” warming and warming between 1.52 C and 3.72 C is not exactly trivial.⁴⁵ But if developing nations were included, far more significant reductions could be anticipated.

The need for broad participation has important implications for questions of efficiency, effectiveness, and justice.⁴⁶ Suppose, for example, that Northeastern states followed what has been urged as a “3 percent solution,” in the form of annual emissions reductions of 3 percent.⁴⁷ With such reductions, the total effect on warming by 2100 would be very small – probably well under 0.01 C. By itself, such an approach would

³⁹ See Stewart and Wiener, *supra* note.

⁴⁰ See the outline in Robert Percival et al., *Environmental Regulation* (2006).

⁴¹ See Nordhaus and Boyer, *supra* note, at 167-68; Stewart and Wiener, *supra* note, at 85-88.

⁴² Nordhaus and Boyer, *supra* note, at 152.

⁴³ See Intergovernmental Panel on Climate Change, *supra* note; Nordhaus, *supra* note at 11.

⁴⁴ For an estimate of the savings from a 0.3 C reduction in warming, see Nordhaus and Boyer, *supra* note, at 156-167 (suggesting \$96 billion in worldwide benefits).

⁴⁵ See Stewart and Wiener, *supra* note, at 45-46. Lomborg, *supra* note, at 22, finds that the Kyoto Protocol, with American participation, would reduce warming by 0.1 F by 2050 and by 0.3 F by 2100; the analysis is based on T.M. L. Wigley, *The Kyoto Protocol: CO₂, CH₄, and Climate Implications*, 25 *Geophysical Research Letters* 2285 (1998).

⁴⁶ See Nordhaus, *supra* note at 76.

⁴⁷ Peter Frumhoff et al., *Confronting Climate Change in the U.S. Northeast* (July 2007), available at <http://www.climatechoices.org/assets/documents/climatechoices/confronting-climate-change-in-the-u-s-northeast.pdf>

impose significant costs, including some hardship on people who are not wealthy, in return for trivial gains.⁴⁸ And if the United States committed to significant reductions on its own – by, say, capping emissions at the rates prevailing in 2000 – the commitment would have little discernible effect on climate change by 2100 (again probably under 0.01 C⁴⁹). By itself, such an approach would impose real costs on the United States, benefit that nation very little or perhaps not at all, and fail to do much for the world as a whole.⁵⁰ As we will see, China's emissions already exceed and will soon dwarf those of the United States; but if China acted on its own to freeze its emissions as of 2007, the effects would also be modest (again probably under 0.01 C).

In the context of ozone-depleting chemicals, the analysis was altogether different. Unilateral action by the United States, restricting the emissions of such chemicals, was very much in the interest of the United States.⁵¹ Such unilateral action was relatively inexpensive and by itself promised to produce significant gains in the form of reduced cases of skin cancer and cataracts.⁵² For greenhouse gases, by contrast, it is plain that unilateral action by the United States would not be in the domestic interest of that nation, simply because the cost would be significant and the benefits necessarily small.⁵³

B. Emitters

To understand the issues of justice and the motivations of the various actors, it is important to appreciate the disparities in emissions across nations. We do not have clear data on the costs of emissions reductions for different nations, but it seems clear that the largest carbon emitters would bear the largest burdens from (say) a worldwide carbon tax.⁵⁴ For a snapshot, consider the following:

⁴⁸ It is possible, of course, that steps of this kind could spur other such steps, in which case the benefits would increase.

⁴⁹ This judgment comes from the finding that the Kyoto Protocol itself, with American participation, would reduce warming by 0.3 C. If the United States stabilized emissions at 2000 levels, it would produce a small fraction of that benefit, first because the United States is only one nation, and second because Kyoto called for a percentage reduction (8 percent) from 1990.

⁵⁰ We are not arguing against such a step, which, as noted, could spur additional ones. We return to this issue below. See *infra*.

⁵¹ See Barrett, *supra* note, at 228.

⁵² See *id.*

⁵³ Note as before that unilateral action might be justified as a way of spurring activity by a range of nations, above all the developing world, which is most unlikely to act if the United States does not. Our goal is to state the consequences of unilateral action, not to argue against it.

⁵⁴ This judgment is crude. If a high-emitting nation could reduce its emissions at relatively low cost, perhaps because of technological innovation, its burdens of course would be lower.

Table 1
*Share of Global Emissions, 2003 and 2004*⁵⁵

	2003	2004
United States	22.7%	22.0%
OECD Europe	16.9%	16.3%
China	15.3%	17.5%
India	4.1%	4.1%
Japan	4.9%	4.7%
Africa	3.5%	3.4%
Russia	4.2%	4.2%

As early as 2004, then, the United States and China emerged as the top emitters, accounting for nearly 40% of the world's total. If the goal is to understand the costs of controls, however, this table does not tell us nearly enough; we need to know future projections as well. Existing projections suggest that the largest contributors are likely to continue to qualify as such—but that major shifts will occur, above all with emissions growth in China and India, and emissions reductions in Russia and Germany.

Table 2
*Carbon Dioxide Emissions Changes, 1990–2004*⁵⁶

	1990–2004
China	108.3%
United States	19.8%
India	87.5%
South Korea	104.6%
Iran	110.7%
Indonesia	137.7%
Saudi Arabia	85.6%
Brazil	67.8%
Spain	59.0%
Pakistan	96.6%
Poland	-15.3%
EU-25	1.6%
Germany	-12.2%
Ukraine	-47.1%
Russia	-24.8%

With these trends, we can project changes to 2030. At that time, the developing world is expected to contribute no less than 55% of total emissions, with 45% coming

⁵⁵ United States Energy Information Administration, International Energy Outlook 2007 93 (2007).

⁵⁶ Emissions of CO₂ from energy-related sources only. See International Energy Agency, CO₂ Emissions From Fuel Combustion 1971-2004 II.4-II.7 (2006).

from developed nations.⁵⁷ At that time, the United States is expected to be well below China.

Table 3
*Relative Contributions of Annual Carbon Dioxide Emissions by Country/Region (Approximate % of Worldwide Emissions)*⁵⁸

	1990	2003	2004	2010	2015	2020	2025	2030
United States	23.5%	22.7%	22.0%	20.1%	19.4%	18.8%	18.7%	18.5%
OECD Europe	19.3%	16.9%	16.3%	14.6%	13.4%	12.4%	11.6%	10.9%
China	10.5%	15.3%	17.5%	21.1%	22.4%	23.9%	25.0%	26.2%
India	2.7%	4.1%	4.1%	4.2%	4.4%	4.7%	4.9%	5.0%
Japan	4.8%	4.9%	4.7%	4.1%	3.8%	3.5%	3.3%	3.0%
Africa	3.1%	3.5%	3.4%	3.7%	3.8%	3.9%	3.9%	3.9%

This projection is fairly recent, but with explosive emissions growth in China, it is already out of date. China surpassed the United States in CO₂ emissions in June 2007 or perhaps before.⁵⁹

The numbers we have presented refer to *flows*: how much a given nation emits on an annual basis. Also relevant for claims of justice, as we shall see, are the *stocks*: how much a given nation has, over time, contributed to the current stock of greenhouse gases in the atmosphere. Table 4 tells the story.

Table 4
*Cumulative Emissions (1850-2003)*⁶⁰

	CO2	Rank	Share
United States	318740	1	29%
China	85314	4	8%
European Union	286764	2	26%
Russia	88302	3	8%
Japan	45198	7	4%
India	24347	9	2%
Germany	78499	5	7%
United Kingdom	67348	6	6%
Canada	23378	11	2%
South Korea	8500	23	1%

The countries are listed in the order of their annual emissions as of 2003. Column 3 shows that while the United States is by far the highest ranked contributor to the stock

⁵⁷ US Energy Information Administration, *supra* note.

⁵⁸ *Id.*

⁵⁹ See Audra Ang, China Overtakes U.S. as Top CO₂ Emitter, Associated Press Online, June 21, 2007

⁶⁰ See World Resources Institute's Climate Analysis Indicators Tool (<http://cait.wri.org/>). CO₂ is in megatons.

as well as to flows, China drops to a distant fourth, India to ninth, and South Korea to twenty-third.

The reason for these disparities is that greenhouse gases dissipate very slowly, so countries that industrialized earlier have contributed more to the stock than countries that industrialized later, even though the latter might today contribute more on an annual basis. About half the CO₂ emitted in 1907 still remains in the atmosphere.⁶¹ And if the world stopped emitting CO₂ today, the stock of CO₂ in the atmosphere in 2107 would remain at about 90 percent of what it is now.⁶² This point greatly matters to many issues; it helps to explain, for example, why even significant emissions reductions will reduce but hardly halt anticipated warming. We are now in a better position to see why unilateral action, even by the largest emitters, will accomplish so little. Such action cannot affect the existing stock, and by definition, it will do nothing (directly) about the rest of the flow.

C. Victims

Which nations are expected to suffer most from climate change? Of course the precise figures are greatly disputed⁶³; the extent of the damage in 2100 cannot be specified now, in part because of a lack of information about each nation's ability to adapt to warmer climates. But it is generally agreed that the poorest nations will be the biggest losers by far.⁶⁴ The wealthy nations, including the United States, are in a much better position for three independent reasons.⁶⁵ First, they have much more in the way of adaptive capacity. Second, a smaller percentage of their economy depends on agriculture, a sector that is highly vulnerable to climate change. Third, the wealthy nations are generally in the cooler, higher latitudes, which also decreases their vulnerability.⁶⁶

To get a handle on the problem, let us assume that warming will be 2.5 C, and consider a prominent estimate of how the harms are likely to vary across nations and regions:

⁶¹ See IPCC, *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, FAQ 10.3 (2007).

⁶² *Id.*

⁶³ For various accounts, see Stern, *supra* note; Intergovernmental Panel on Climate Change.

⁶⁴ Stern, *supra* note, at 139; Richard Tol, *Estimates of the Damage Costs of Climate Change*, 21 *Environmental and Resource Economics* 135 (2002).

⁶⁵ Stern, *supra* note, at 139.

⁶⁶ *Id.*

Table 5
Damages of a 2.5 C Degree Warming As a Percentage of GDP⁶⁷

India	4.93
Africa	3.91
OECD Europe	2.83
High income OPEC	1.95
Eastern Europe	0.71
Japan	0.50
United States	0.45
China	0.22
Russia	-0.65

On these estimates, it is readily apparent that some nations are far more vulnerable than others.⁶⁸ The United States, China, and Russia are expected to lose relatively little from 2.5 C warming; indeed, Russia is expected to gain. By contrast, India and Africa are anticipated to be massive losers. India is expected to experience devastating losses in terms of both health and agriculture. In terms of health alone, India has been projected to lose 3,600,000 years of life because of climate-related diseases, with 769,000 years of life lost from malaria.⁶⁹ For Africa, the major problem involves health, with a massive anticipated increase in climate-related diseases.⁷⁰ Sub-Saharan Africa has been projected to lose 26,677,000 years of life because of climate-related diseases, with 24,385,000 coming from malaria.⁷¹

By contrast, the United States faces significant but unquestionably more limited threats to both agriculture and health. Consider a careful study of the long-run effects of climate change on a range of economic variables in the United States.⁷² The study offers both optimistic projections by 2100, including a high level of adaptation and low warming, and pessimistic projections, involving little adaptation and higher warming. For 3 C warming, the most optimistic case projects an increase of one percent in GDP⁷³; the benefits are highest at 2 C warming and decline from 3.5 C. The most pessimistic case

⁶⁷ Nordhaus and Boyer, *supra* note, at 91.

⁶⁸ Tol, *supra* note, is in general accord. William Cline, *Climate Change*, in *Global Problems, Global Solutions* 13 (Bjorn Lomborg ed. 2004), and Frank Ackerman and Ian Finlayson, *The Economics of Inaction on Climate Change: A Sensitivity Analysis* (forthcoming 2007), offer a picture of more serious monetized damage from climate change.

⁶⁹ Nordhaus and Boyer, *supra* note, at 81.

⁷⁰ *Id.*

⁷¹ *Id.*

⁷² See Dale Jorgenson et al., *U.S. Market Consequences of Global Climate Change* (2004), available at http://www.pewclimate.org/global-warming-in-depth/all_reports/marketconsequences; see also the brief summary in Stern, *supra* note, at 147-148.

⁷³ *Id.*

projects losses of 1.2 percent of GDP at 3 C.⁷⁴ These estimates should not be taken as undisputed, and the risk of catastrophe greatly complicates matters.⁷⁵ But to the extent that the United States anticipates that it is likely to lose little, on net, from climate change, its incentive to agree to expensive emissions reductions will not be very high.⁷⁶ And if the United States anticipates a realistic “worst case,” at 3 C warming, of 1.2 percent loss in GDP by 2100, the incentive is relatively weak.

Like Russia, China has been projected to benefit in terms of agriculture,⁷⁷ and while it will suffer health losses, they are relatively modest, far below those expected in Africa and India.⁷⁸ On one projection, China will lose 603,000 years of life from climate-related causes, and just 8000 from malaria.⁷⁹ The loss of more than 600,000 years of life is highly significant, but it is far below the corresponding losses for the most threatened nations. To the extent that the losses are not overwhelming, we might expect that China would be unlikely to be particularly interested in reducing greenhouse gas emissions, at least on these figures; thus far, the nation’s behavior is consistent with that prediction.⁸⁰ For China, a higher priority might well be, and indeed has been, economic growth, even or perhaps especially if the goal is to prevent premature death. Note in this regard the striking fact that the citizens of China and the United States are less concerned about climate change than are the citizens of Japan, France, Spain, India, Britain, and Germany.⁸¹

From this brief survey, it seems useful to analyze the questions of justice by assuming that the world would benefit from an agreement to control greenhouse gas emissions; that the United States would have to pay a significant amount to reduce its emissions⁸²; that some nations would benefit far more than others from world-wide reductions; and that the United States would not be the largest beneficiary and could even be a net loser from a large uniform carbon tax or from a cap-and-trade program that requires major reductions from existing emissions levels.

Our primary question is how to understand the moral obligations of the United States; we are secondarily interested in the proper approach to China. Assume, for

⁷⁴ Id.

⁷⁵ See *infra*; National Research Council, *Abrupt Climate Change: Inevitable Surprises* (2004); *Avoiding Dangerous Climate Change* (Hans Schellnuber et al. eds 2006). For a technical discussion, see Martin Weitzman, *Structural Uncertainty and the Value of a Statistical Life in the Economics of Catastrophic Climate Change* (2007), available at <http://www.aei-brookings.org/publications/abstract.php?pid=1196>

⁷⁶ A dated but helpful overview of various assessments can be found in Nordhaus and Boyer, *supra* note, at 70.

⁷⁷ See *id* at 76.

⁷⁸ See *id* at 81.

⁷⁹ Id.

⁸⁰ See Geoffrey York, Citing “Right To Development,” China Rejects Emission Cap, *Globe and Mail*, June 5, 2007, at A1.

⁸¹ See *Doing It Their Way*, *The Economist* 22 (Sept. 9-16, 2006).

⁸² This point is confirmed in the context of the Kyoto Protocol in Nordhaus and Boyer, *supra* note; the United States would have had to pay by far the most of any nation to comply with its obligations. *Id.* at 91. On one estimate, the United States would have had to pay between 50% and 80% of the total cost. See Stewart and Wiener, *supra* note.

purposes of clarifying the problem, that the optimal global carbon tax is \$40 per ton of carbon. On the basis of the evidence above, it could well be that the optimal tax for the United States is just \$20 per ton, while the optimal tax for China is only \$10 per ton. If we assume that nations are motivated by domestic self-interest, this means that a \$10 per ton agreement should be feasible; a \$20 per ton agreement is feasible too, but only if others pay China \$10 per ton to reduce its emissions; and a \$40 per ton agreement is feasible as well, but only if others pay the United States \$20 per ton, and China \$30 per ton, to reduce their emissions.

It is tempting to think that, on the assumptions that we have given, the United States should actually pay \$40 per ton, and perhaps that China should too. On one view, the United States, at least, should face special obligations in the context of climate change – special in the distinctive sense that the United States should sign an agreement that is in the world's interest but not its own. It would be possible to go further and to suggest that the United States is obliged to transfer large sums of money to compensate (poor? all?) countries at risk from climate change. We now turn to the foundations of these views.

III. Climate Change and Distributive Justice

To separate issues of distributive justice from those of corrective justice, and to clarify intuitions, let us begin with a risk of natural calamity that does not involve human action at all.

A. The Asteroid

Imagine that India faces a serious new threat of some kind – say, a threat of a collision with a large asteroid. Imagine too that the threat will not materialize for a century. Imagine finally that the threat can be eliminated, today, at a cost. India would be devastated by having to bear that cost now; as a practical matter, it lacks the resources to do so. But if the world acts as a whole, it can begin to build technology that will allow it to divert the asteroid, thus ensuring that it does not collide with India a century hence. The cost is high, but it is lower than the discounted benefit of eliminating the threat. If the world delays, it might also be able to eliminate the threat, or to reduce the damage if it comes to fruition. But many scientists believe that the best approach, considering relevant costs and benefits, is to start immediately to build technology that will divert the asteroid.

Are wealthy nations, such the United States, obliged to contribute significant sums of money to protect India from the asteroid? On grounds of distributive justice, it is tempting to think so. But if we do reach that conclusion, how is the case different from one in which India contends, now, that it would be able to avert millions of premature deaths from disease and malnutrition if the United States gave it (say) one or two percent of its Gross Domestic Product? If one nation is threatened by malaria or a tsunami, other nations might well agree that it is appropriate to help; it is certainly generous and in that

sense commendable to assist those in need. But even generous nations do not conventionally think that a threatened nation has an entitlement to their assistance.⁸³

The problem of the asteroid threat does have a significant difference from that of climate change, whose adverse effects are not limited to a single nation. To make the analogy closer, let us assume that all nations are threatened by the asteroid, in the sense that it is not possible to project where the collision will occur; scientists believe that each nation faces a risk. But the risk is not identical. Because of its adaptive capacity, its technology, and a range of other factors, let us stipulate that the United States is less vulnerable to serious damage than (for example) India and the nations of Africa and Europe. Otherwise the problem is the same. Under this assumption, the world will certainly act to divert the asteroid, and it seems clear that the United States will contribute substantial resources for that purpose. Let us suppose that all nations favor an international agreement that requires contributions to a general fund, but that because it is less vulnerable, the United States believes that the fund should be smaller than the fund favored by the more vulnerable nations of Africa and Europe, and by India. From the standpoint of domestic self-interest, then, those nations with the most to lose will naturally seek a larger fund than those nations facing lower risks.

At first glance, it might seem intuitive to think that the United States should accept the proposal for the larger fund, simply because it is so wealthy. If resources should be redistributed from rich to poor, on the ground that redistribution would increase overall welfare or promote fairness,⁸⁴ the intuition appears sound. But there is an immediate problem: If redistribution from rich nations to poor nations is *generally* desirable, it is not at all clear that it should take the particular form of a deal in which the United States joins an agreement that is not in its interest. The more sensible kind of redistribution would be a cash transfer, so that poor nations can use the money as they see fit. Perhaps India would prefer to spend the money on education, or on AIDS prevention, or on health care in general. If redistribution is what is sought, a generous deal with respect to the threat of an asteroid collision seems a crude way of achieving it. Analytically, that deal has some similarities to a grant of housing assistance to poor people, when poor people might prefer to spend the money on food or health care. If redistribution is desirable, housing assistance is better than nothing, but it remains puzzling why wealthy nations should be willing to protect poor nations from the risks of asteroid collisions (or climate change), while not being willing to give them resources with which they can set their own priorities. Indeed, a generous deal with respect to the asteroid threat is in a sense worse than housing assistance, as a redistributive strategy, because by hypothesis, many of the beneficiaries of the deal are in rich nations and are not poor at all – a point to which we will return.

There is a further difficulty. We have stipulated that the asteroid will not hit the earth for another 100 years. If the world takes action now, it will be spending current

⁸³ Some people appear to believe that poor nations have an entitlement to help from wealthy nations. See Martha C. Nussbaum, *Frontiers of Justice* (2005). But even if this is so, assistance in the case we are describing is less valuable than direct financial aid – a point that we shall be emphasizing.

⁸⁴ See Posner, *supra* note; Nussbaum, *supra* note.

resources for the sake of future generations, which are likely to be much richer.⁸⁵ The current poor citizens of poor nations are probably much poorer than will be the *future* poor citizens of those nations. If the goal is to help the poor, it is odd for the United States to spend significant resources to help posterity while neglecting the present.⁸⁶ Thus far, then, the claim that the United States should join what seems, to it, to be an unjustifiably costly agreement to divert the asteroid is doubly puzzling. Poor nations would benefit more from cash transfers, and the current poor have a stronger claim to assistance than the future (less) poor.

From the standpoint of distributional justice, there are additional problems. Nations are not people; they are collections of people, ranging from very rich to very poor. Wealthy countries, such as the United States, have many poor people, and poor countries, such as India, have many rich people. If the United States is paying a lot of money to avert the threat of an asteroid collision, it would be good to know whether that cost is being paid, in turn, by wealthy Americans or by poor Americans. If redistribution is our goal, it would also be good to know whether the beneficiaries are mostly rich or mostly poor. Many of the beneficiaries of actions to reduce a worldwide risk are in wealthy nations, and so it should be clear that the class of those who are helped will include many people who are not poor at all. Because the median member of wealthy nations is wealthier than the median member of poor nations, it is plausible to think that if wealthy nations contribute a disproportionately high amount to the joint endeavor, the distributive effects will be good. For example, the Americans who are asked to make the relevant payments are, on average, wealthier than the Indians who are paying less. But asking Americans to contribute more to a joint endeavor is hardly the best way of achieving the goal of transferring wealth from the rich to the poor.

B. Climate Change: From Whom to Whom?

In terms of distributive justice, the problem of climate change is closely analogous to the asteroid problem. In fact, the argument from distributive justice is even weaker in the case of climate change. No one would gain from an asteroid collision, but millions of people would benefit from climate change.⁸⁷ Many people die from cold, and to the extent that warming reduces cold, it will save lives.⁸⁸ Warming will also produce monetary benefits in many places, above all as a result of increases in agricultural productivity, for example in Russia.⁸⁹ Indeed, many millions of poor people are likely to benefit from climate change.⁹⁰ Some of them will live when they would otherwise die from extreme cold.⁹¹ In China, many millions of people living in rural areas continue to

⁸⁵ See Schelling, *supra* note.

⁸⁶ We are putting to one side the possibility that technological change will make it easier to divert the asteroid in the future. By hypothesis, specialists do believe that cost-benefit analysis justifies immediate action. But it is possible that because of technological advances, future generations will be able to eliminate the threat more cheaply than present generations can.

⁸⁷ See Todd Sandler, *Global Public Goods* (2004); Lomborg, *supra* note.

⁸⁸ See Lomborg, *supra* note.

⁸⁹ See Nordhaus and Boyer, *supra* note, at 91.

⁹⁰ *Id.*

⁹¹ See Lomborg, *supra* note.

be extremely poor despite the increasing prosperity of the nation as a whole. These people are among the poorest in the world. For at least some of these people, climate change could well provide benefits by increasing the productivity of their land.⁹²

In addition, many millions of poor people would be hurt by the cost of emissions reductions. They would bear that cost in the form of higher energy bills, lost jobs, and increased poverty. Recall too that industrialized and relatively wealthy European nations have been found to be at greater risk than the relatively poorer China.⁹³

It follows that purely as an instrument of redistribution, emission reductions on the part of the United States are quite crude. Although a suitably designed emissions control agreement would almost certainly help poor people more than it would hurt them, because disadvantaged people in Africa and India are at such grave risk,⁹⁴ there is a weak connection between distributive goals on the one hand and requiring wealthy countries to pay for emissions reductions on the other.

To see the problem more concretely, suppose that Americans (and the same could be said about citizens in other wealthy countries) are willing to devote a certain portion, X , of their national income to helping people living in poor countries. The question is, How is X best spent? If X is committed to emissions controls, then X is being spent to benefit wealthy Europeans as well as impoverished Indians, and, perversely, X is being spent to harm some impoverished people living in China and Russia. And if all of X is spent on global emissions control, then none of X is being spent to purchase malaria nets or to distribute AIDS drugs—which are highly effective ways of helping poor people who are alive today rather than poor people who will be alive in one hundred years.⁹⁵

One response to this argument is that Americans should pay more than X : they should pay $2X$ or $5X$ or $100X$. But this argument is not responsive. If Americans are willing to pay $2X$ or $5X$ or $100X$, the question remains how this money should be used, and it is quite possible that $100X$ is better spent on malaria nets and AIDS drugs than on global emissions control, if the only goal is to help the poor.

To be sure, it may turn out to be the case that, in fact, the best way to spend X is to cut greenhouse gas emissions. It could be the case, for example, that more lives are saved from cutting greenhouse gas emissions than from distributing malaria nets and AIDS drugs, given a constant amount of money, and taking into account the fact that future lives and current lives must be put on a common metric.⁹⁶ A legitimate argument for cutting greenhouse gas emissions is that it bypasses the governments of poor states more completely than other forms of development aid do. This might be counted as a virtue because the governments of poor states are, to a large degree, inefficient and

⁹² See Nordhaus and Boyer, *supra* note, at 76 (showing agricultural gain from 2.5 C warming).

⁹³ See Table 5 *supra*.

⁹⁴ See Nordhaus and Boyer, *supra* note, at 80-92.

⁹⁵ For this argument in the more general context of tort and regulatory standards, see Eric A. Posner and Cass R. Sunstein, *Dollars and Death*, 72 U. Chi. L. Rev. 537, 583-84 (2005); as applied to climate change, see Lomborg, *supra*.

⁹⁶ This view is firmly rejected, however, in *Global Problems, Global Solutions*, *supra* note.

corrupt, and partly for that reason, ordinary development aid has not been very effective.⁹⁷ On the other hand, this form of redistribution does not, as we have stressed, help existing poor people at all; it can, at best, help poor people in future generations.

The point for present purposes is that in principle, redistribution through greenhouse gas cuts is most unlikely to be the best way to help poor people or poor nations. It is possible that the more direct methods are inferior, for example because it is not feasible to provide that direct aid; but this argument has not been made out.⁹⁸

C. Provisional Conclusions

As we have said, there are strong arguments, rooted in both welfarism and fairness, to support the view that rich countries should be making large lump-sum payments to poor ones. But rich countries are not now making such payments, and poor nations are not insisting on them as a matter of right.⁹⁹ As a normative matter, we believe that the best approach would be to separate the question of redistribution from that of appropriate climate change policy. There are strong arguments on behalf of a uniform carbon tax, one that would, in the relevant sense, treat rich and poor nations alike. There are also strong arguments on behalf of a worldwide cap-and-trade program, taking existing emissions rates as the starting point. What is puzzling is the claim that on distributive justice grounds, the best approach is for the United States to join an agreement that is not in its interest (recall the possibility that the optimal carbon tax for the world, assuming universal participation, is higher than the optimal carbon tax for the United States, again assuming universal participation).

We agree, however, that if the United States does spend a great deal on emissions reductions as part of an international agreement, and if the agreement does give particular help to disadvantaged people, considerations of distributive justice support its action, even if better redistributive mechanisms are imaginable. It is even possible that desirable redistribution is more likely to occur through climate change policy than otherwise, or to be accomplished more effectively through climate policy than through direct foreign aid. And we agree that if the United States is willing to bear a disproportionate share of the cost of greenhouse gas emissions, to reduce the harms faced above all in poor nations, disadvantaged people are likely to be benefited on balance.

Our only claims are that the aggressive emissions reductions on the part of the United States are not an especially effective method for transferring resources from wealthy people to poor people, and that if this is the goal, many alternative policies would be better. It should be clear that these claims apply broadly to efforts to invoke

⁹⁷ William Easterly, *The White Man's Burden* (2006).

⁹⁸ See *Global Problems, Global Solutions*, *supra* note.

⁹⁹ Rich nations do make small foreign aid contributions, much but not all of which appears to be designed to further specific foreign policy goals. See Alberto Alesina and David Dollar, *Who Gives Foreign Aid To Whom And Why*, 5 *J. Econ. Growth* 33 (2000). And although poor nations have sought various redistributive concessions in international agreements, they have for the most part failed to achieve them.

distributive justice to ask wealthy nations to participate in international agreements from which other nations might gain.

IV. Corrective Justice

Climate change differs from our asteroid example in another way. In the asteroid example, no one can be blamed for the appearance of the asteroid and the threat that it poses to India. But many people believe that by virtue of its past actions and policies, the United States, along with other developed nations, is particularly to blame for the problem of climate change.¹⁰⁰ In the international arena, the argument that the United States has an obligation to devote significant resources to reducing greenhouse gas emissions is not solely and perhaps not even mainly an argument about distributive justice. The argument also rests on moral intuitions about corrective justice – about wrongdoers and their victims.¹⁰¹

A. The Basic Argument

Corrective justice arguments are backward-looking, focused on wrongful behavior that occurred in the past.¹⁰² Corrective justice therefore requires us to look at stocks rather than flows. Even though China is now the world's leading greenhouse gas emitter, the United States has been the largest emitter historically, and thus has the greatest responsibility for the stock of greenhouse gases in the atmosphere. Of course, a disproportionate share of the stock of greenhouse gases can be attributed to other long-industrialized countries as well, such as Germany and Japan, and so what we say here about the United States can be applied, *mutatis mutandi*, to those other countries. The emphasis on the United States is warranted by the fact that the United States has contributed more to the existing stock than any other nation (nearly 30 percent).

In the context of climate change, the corrective justice argument is simply that the United States wrongfully harmed the rest of the world—especially, low-lying states and others that are most vulnerable to global warming—by emitting greenhouse gases in vast quantities. On a widespread view, corrective justice requires that the United States devote

¹⁰⁰ See e.g., Jiahua Pan, Common but Differentiated Commitments: A Practical Approach to Engaging Large Developing Emitters Under L20 (2004), available at <http://www.l20.org/libraryitem.php?libraryId=6>; Singer, *supra*.

¹⁰¹ We do not address whether there are *legal* challenges, specifically tort challenges, to greenhouse gas emissions. There is an extensive literature on this topic. See, e.g., Eduardo M. Penalver, Acts of God or Toxic Torts? Applying Tort Principles to the Problem of Climate Change, 38 Nat. Resources J. 563 (1998); David A. Grossman, Warming Up To a Not-So-Radical Idea: Tort-Based Climate Change Litigation, 28 Colum. J. Envtl. L. 1 (2003); James Salzman & David Hunter, Negligence in the Air: The Duty of Care in Climate Change Litigation, U Pa L Rev (forthcoming 2007). For a discussion of the possibility of tort claims brought under the Alien Tort Statute, see Posner, *supra*. However, the tort claim and the moral claim are overlapping, as we note, *infra*.

¹⁰² For this reason, corrective justice claims will not be appealing to welfarists, who tend to think that corrective justice is relevant, if at all, because it serves as a proxy for what welfarism requires. See Louis Kaplow and Steven Shavell, Fairness versus Welfare (2005). We tend to think that welfarists are generally correct here but bracket that point and the associated complexities for purposes of discussion.

significant resources to remedying the problem¹⁰³—perhaps by paying damages, perhaps by agreeing to extensive emissions reductions, and perhaps by participating in an agreement that is not in its self-interest. India, for example, might be thought to have a moral claim against the United States, one derived from the principles of corrective justice, and on this view the United States has an obligation to provide a compensatory remedy to India. (Because India is especially vulnerable to climate change,¹⁰⁴ we use that nation as a placeholder for those at particular risk.)

This argument enjoys a great deal of support in certain circles,¹⁰⁵ and seems intuitively correct. The apparent simplicity of the argument, however, masks some serious difficulties. We shall identify a large number of difficulties here, and the discussion will be lamentably complex. The most general point, summarizing the argument as a whole, is that the climate change problem poorly fits the corrective justice model, because the consequence of tort-like thinking would be to force many people who have not acted wrongfully to provide a remedy to many people who have not been victimized.

B. The Aggregation Problem

The United States is not a person, nor is India. Corrective justice is typically a matter between individuals, not entities. To see the problem, consider the recent International Court of Justice suit brought by Bosnia-Herzegovina against Serbia, charging Serbia with genocide during the Yugoslav civil war of the early 1990s.¹⁰⁶ Suppose that Bosnia-Herzegovina had won this case, and Serbia had been forced to pay reparations. No such entity called “Serbia” can pay out of its pocket; the reparations would be financed out of general revenues, paid for by taxes. Thus, the effect of the remedy would be to raise taxes or reduce government services for some or all Serbians, while benefiting some or all Bosnians through lower taxes, lump sum payments, or increased government services.

Can such an effect be justified? Possibly, but the point for present purposes is just that talk of corrective justice between states can be only a metaphor. States do not act; individuals act. States do not have mental states; individuals have mental states. To evaluate the moral considerations touching on claims between states, one needs to penetrate the veil of the state and consider the activities of the people who operate their governments and the people who are affected by their policies. Indeed, Bosnia’s claim was not based on any injury to “Bosnia”; it was based on an injury to Bosnians. If any state was a victim of the civil war, it was Yugoslavia, which was broken into pieces, and

¹⁰³ See, e.g., Daniel Farber, *Adapting to Climate Change: Who Should Pay*, U Pa L Rev (forthcoming 2007).

¹⁰⁴ See Nordhaus and Boyer, *supra* note, at 91.

¹⁰⁵ See note *supra*.

¹⁰⁶ *Application of the Convention on the Prevention and Punishment of the Crime of Genocide (Bosnia and Herzegovina v. Serbia and Montenegro)*, International Court of Justice, Judgment of Feb. 26, 2007 (available at: <http://www.icj-cij.org/docket/index.php?p1=3&p2=3&k=f4&case=91&code=bhy&p3=4>). The Court ultimately denied Bosnia a remedy.

yet no one thinks that “Yugoslavia” or some representative or successor has a claim against whoever was responsible for its dismemberment.

Thus, to evaluate India’s claim against the United States for wrongfully causing climate change, we must consider the actions of individuals, and the effects on individuals, and try to avoid referring to states qua states.

C. The Wrongdoer Identity Problem

The current stock of greenhouse gases in the atmosphere is due to the behavior of people living in the past. Much of it is due to the behavior of people who are dead. The basic problem for corrective justice is that dead wrongdoers cannot be punished or held responsible for their behavior, or forced to compensate those they have harmed. Holding Americans today responsible for the activities of their ancestors is not fair or reasonable on corrective justice grounds, at least not unless contemporary Americans can be said to have benefited from the actions of their ancestors (an issue to which we shall return).

Indeed, many Americans today do not support the current American energy policy, appear not to benefit from it, and already make some sacrifices to reduce the greenhouse gas emissions that result from their behavior. Holding these people responsible for the wrongful activities of people who lived in the past seems perverse. An approach that emphasized corrective justice would attempt to be more finely tuned, focusing on particular actors, rather than Americans as a class.

Consider again the Bosnia-Serbia conflict. Many people who are currently Serbian citizens had no role in planning the genocide and did not benefit from it; some of them opposed the nationalistic policies of Serbia at the time, at great personal risk. Many Serbians today were children or not born during the genocide, and others immigrated after the genocide (some as refugees escaping atrocities in Bosnia). And some people living in Serbia are victims of the genocide, or relatives of the victims, or victims of retaliation by Bosnians. Yet by holding Serbia liable for the genocide, one forces all these people to pay higher taxes. This violates moral intuitions against collective responsibility.¹⁰⁷

The most natural and best response to this point is to distinguish conflicts of this kind and to insist that all or most Americans today benefit from the greenhouse gas-emitting activities of Americans living in the past, and therefore it would not be wrong to require Americans today to pay for abatement measures. This argument is familiar from

¹⁰⁷ See, e.g., H.D. Lewis, *Collective Responsibility (A Critique)* in *Collective Responsibility: Five Decades of Debate in Theoretical and Applied Ethics* 17-34 (Larry May & Stacey Hoffman eds., 1991). In recent years, some philosophers have challenged traditional criticisms of collective responsibility, but these philosophers tend to ground collective responsibility in individual failures to act when action was possible and likely to be effective, and the person in question knew or should have known that she could have prevented the harm. See, e.g., Larry May, *Sharing Responsibility* (1992); cf. Brent Fisse & John Braithwaite, *Corporations, Crime and Accountability* 50 (1993); Christopher Kutz, *Complicity: Ethics and Law for a Collective Age* 166-253 (2000); David Copp, *Responsibility for Collective Inaction*, *J. Soc. Phil.*, Fall 1991, at 71.

debates about slave reparations, where it is argued that Americans today have benefited from the toil of slaves one hundred and fifty years ago.¹⁰⁸ To the extent that members of current generations have gained from past wrongdoing, it may well make sense to ask them to make compensation to those harmed as a result. On one view, compensation can work to restore the status quo ante, that is, to put members of different groups in the position that they would have occupied if the wrongdoing had not occurred.

However, this argument runs into serious problems. In the context of climate change, the initial difficulty is that the empirical basis of the argument is obscure. Many Americans today are, of course, immigrants or children of immigrants, and so not the descendants of greenhouse gas-emitting Americans of the past. It is possible that such people nonetheless benefit from past emissions, but perhaps they have received little or nothing from them. Further, not all Americans inherit the wealth of their ancestors, and even those who do would not necessarily have inherited less if their ancestors' generations had not engaged in the greenhouse gas-emitting activities.

From the standpoint of corrective justice, there is a more fundamental point. As long as the costs are being toted up, the benefits should be as well. Climate change is itself anticipated to produce benefits for many nations, both by increasing agricultural productivity and by reducing extremes of cold.¹⁰⁹ And if past generations of Americans have imposed costs on the rest of the world, they have also conferred substantial benefits. American industrial activity has produced products that were consumed in foreign countries, for example, and drove technological advances that other countries have benefited from. What would the world, or India, look like if the United States had engaged in 10 percent of its level of greenhouse gas emissions, or 20 percent, or 40 percent? For purposes of corrective justice, a proper accounting would seem to be necessary, and it presents formidable empirical and conceptual problems.

In the context of slave reparations, the analogous points have led to interminable debates, both empirical and conceptual, about historical causation.¹¹⁰ But-for causation arguments, used in standard legal analysis and conventional for purposes of conventional justice, present insuperable problems when applied historically. We can meaningfully ask whether an accident would have occurred if the driver had operated the vehicle more carefully, but conceptual and empirical questions make it impossible to answer the question whether white Americans today would have been worse off if there had been no slavery -- and impossible too to ask whether Indians would be better off today if Americans of prior generations had not emitted greenhouse gases. What kind of a question is that? In this hypothetical world of limited industrialization in the United States, India would be an entirely different country, and the rest of the world would be unrecognizably different as well.

¹⁰⁸ Stephen Kershnar, *The Inheritance-Based Claim to Reparations*, 8 *Legal Theory* 243 (2002) (describing and criticizing these arguments). These arguments are often analogized to unjust enrichment arguments. See Eric A. Posner and Adrian Vermeule, *Reparations for Slavery and Other Historical Injustices*, 103 *Colum. L. Rev.* 689 (2003).

¹⁰⁹ See Nordhaus and Boyer, *supra* note; Lomborg, *supra* note.

¹¹⁰ See Posner & Vermeule, *supra*, at ____.

It is sometimes argued that because people take pride in the accomplishments of their nation, they should also take responsibility for its failures.¹¹¹ Americans who take pride in their country's contributions to prosperity and freedom should also take responsibility for its contributions to global warming. This argument, however, is weak. Many people are proud that they are attractive or intelligent, or can trace their ancestry to the Mayflower, or live in a city with a winning baseball team, but nothing about these psychological facts implies moral obligations of any sort. A person who is proud to be American, and in this way derives welfare from her association with other Americans who have accomplished great things, perhaps should be (and is) less proud than she would be if she were not also associated with Americans who have done bad things. She does not have any moral obligation, deriving from her patriotic pride, to set aright what other Americans have done wrong.

D. The Victim/Claimant Identity Problem

As usually understood, corrective justice requires an identity between the victim and the claimant: the person who is injured by the wrongdoer must be the same as the person who has a claim against the wrongdoer. In limited circumstances, a child or other dependent might inherit that claim, but usually one thinks of the dependent as having an independent claim, deriving from the wrongdoer's presumed knowledge that by harming the victim she also harms the victim's dependents.

Who are the victims of climate change? Most of them live in the future. Thus, their claims have not matured. To say that future Indians might have a valid claim against Americans today, or Americans of the past, is not the same as saying that Americans today have a duty to help Indians today—or even Indians in the future. To be sure, some people now living can be said to be victims of climate change.¹¹² People living in low-lying islands or coastal regions can plausibly contend that a particular flood or storm has some probabilistic relationship with climate change—but from the standpoint of corrective justice, this group presents its own difficulties (a point to which we will return shortly). For now, let us focus on the future victims.

Return once more to the Bosnia-Serbia conflict. If reparations had been awarded, the funds would presumably have gone into the general revenues of Bosnia. Yet many people living in Bosnia actually participated in the genocide on the Serbian side; others participated in atrocities directed at Serbians and ethnic Serbians in Bosnia. Many people living in Bosnia were born or came of age after the genocide, or immigrated after the genocide, and so were not directly harmed by it. And yet all these people would benefit from the reparations.

¹¹¹ Cf. Jacob T. Levy, *The Multiculturalism of Fear* 242-43 (2000). Levy argues that such people should feel shame about national failures, and not exactly that they have any moral obligations. However, the latter view seems to reflect many people's intuitions.

¹¹² See Stern, *supra* note.

From the perspective of corrective justice, these results are troublesome. Wrongdoers should compensate victims for their losses, and yet the crude state-to-state remediation scheme results in innocents being punished and non-victims being compensated. As we turn back to climate change, the problem is that the greenhouse-gas abatement remedy does not benefit current victims—those who are currently injured would gain absolutely nothing from reduced American emissions. If this point is not immediately intuitive, it is because states tend, wrongly, to be personified. Perhaps current victims should be compensated, to the extent that they can show that they have been harmed, if only probabilistically, by actions in the past. But who, exactly, are the wrongdoers who have injured them?

A successful abatement program would, of course, benefit many people living in the future, albeit by preventing them from becoming victims in the first place, or reducing the magnitude of their injury, rather than compensating them for harm. The moral basis of such a program is thus not corrective justice—not providing a remedy for a past harm—but simple welfarism. We have said that emissions reductions are justified on welfarist grounds, but that point does not suggest that past emitters have special obligations because of corrective justice.

E. The Causation Problem

Corrective justice requires that the wrongdoing cause the harm. In ordinary person-to-person encounters, this requirement is straightforward. But in the context of climate change, causation poses formidable challenges.

To see why, consider a village of India that is wiped out by a monsoon. One might make a plausible argument that the flooding was more likely than it would otherwise have been, as a result of rising sea levels caused by climate change. But it would be impossible to show that greenhouse gas emissions in the United States caused the flooding, or even contributed to it.¹¹³ If the flooding was in a probabilistic sense the result of greenhouse gas activities around the world, it was also the result of complex natural phenomena that are poorly understood. And to the extent that the United States was involved, much of the contribution was due to people who died many years ago; in all likelihood, little or none was due to people who engage in greenhouse gas activities today.

Causation problems are not fatal to corrective justice claims, but they significantly weaken them. In tort law, occasionally courts are willing to assign liability according to market share when multiple firms contribute to a harm—for example, pollution, or dangerous products whose provenance cannot be traced.¹¹⁴ But statistical relations are not

¹¹³ See R.A. Pielke et. al., *Hurricanes and Global Warming*, 86 *Bulletin of the American Meteorological Society* 1571 (2005) (discussing the uncertain connection between increased hurricane intensity and climate change).

¹¹⁴ See Michael Saks and Peter Blanck, *Justice Improved: The Unrecognized Benefits of Aggregation and Sampling in the Trial of Mass Torts*, 44 *Stan. L. Rev.* 815 (1992).

the same as causation, and at some point they become too weak to support a claim sounding in corrective justice. Such seems to be the case with climate change.¹¹⁵

F. The Culpability Problem

Philosophers disagree about whether corrective justice requires culpability.¹¹⁶ Frequently intentional, reckless, or negligent action is thought to be required for a corrective justice claim. While some people do support strict liability on corrective justice grounds, a degree of culpability is required to make the analysis tractable. Because multiple persons and actions (including those of the victim) are necessary for harm to have occurred, identification of the person who has “caused” the harm requires some kind of assignment of blame.¹¹⁷ At a minimum, the case for a remedy is stronger when a person acts culpably than innocently, and so it is worthwhile to inquire whether the United States or Americans can be blamed for contributing to climate change. Indeed, the notion that Americans have acted in a blameworthy fashion by contributing excessively to climate change is an important theme in popular debates.¹¹⁸

1. *Negligence in general.* The weakest standard of culpability is negligence: if one negligently injures someone, one owes her a remedy. Economists define negligence as the failure to take cost-justified precautions.¹¹⁹ Lawyers tend to appeal to community standards.¹²⁰

Today a scientific consensus holds that the planet is warming, and that this warming trend is a result of human activity.¹²¹ But this consensus took a long time to form. In the modern era, the earliest work on global warming occurred in the 1970s, and it was controversial.¹²² At a minimum, greenhouse gas emitting activities did not become

¹¹⁵ For more on the causation problem, see Eric A. Posner, *Climate Change and International Human Rights Litigation: A Critical Appraisal*, U. Pa. L. Rev. (forthcoming 2007).

¹¹⁶ Compare Jules Coleman, *Tort Law and the Demands of Corrective Justice*, 67 *Indiana L.J.* 349 (1992) (arguing that corrective justice requires a remedy even when the infringing conduct was innocent), and Ernest Weinrib, *Corrective Justice*, 77 *Iowa L. Rev.* 403 (1992) (taking the contrary view). For a very helpful discussion, see Stephen R. Perry, *Loss, Agency, and Responsibility for Outcomes: Three Conceptions of Corrective Justice*, in *Tort Theory* 24 (Ken Cooper-Stephenson & Elaine Gibson eds. 1993).

¹¹⁷ Matthew Adler, *Corrective Justice and Liability for Global Warming*, U. Pa. L. Rev. (forthcoming 2007).

¹¹⁸ See Singer, *supra* note.

¹¹⁹ See Richard A. Posner, *Economic Analysis of Law* 179-183 (5th ed. 1998).

¹²⁰ For simplicity, we will rely on the legal view. However, the legal standard does not, strictly speaking, require culpability. See A.P. Simester, *Can Negligence Be Culpable?*, in *Oxford Essays in Jurisprudence* 85, 87 (Jeremy Horder ed. 2000).

¹²¹ See, e.g., Stern, *supra* note; Nordhaus, *supra* note, at 10; IPCC, *supra* note. We refer to a scientific consensus, but there are dissenting voices. See, e.g., Nir Shaviv, *The Spiral Structure of the Milky Way, Cosmic Rays, and Ice Age Epochs on Earth*, 8 *New Astronomy* 39 (2003) (arguing that cosmic rays are responsible for most of recent variations in global temperatures); Nir Shaviv and J. Veizer, *Celestial driver of Phanerozoic climate?*, 13 *GSA Today*, 4 (2003). A reply is Stefan Rahmstorf et al., *Cosmic Rays, Carbon Dioxide and Climate*, in *Eos, Transactions of the American Geophysical Union* (January 27, 2004).

¹²² See Houghton, *supra* note.

negligent, under existing legal standards, until a scientific consensus formed and it became widely known among the public—a recent occurrence.¹²³

Even today, the argument that engaging in greenhouse-gas emitting activities is negligent seems weak. The scientific consensus does not answer the critical question, for the purpose of determining negligence, of how much any particular activity actually contributes to climate change. Indeed, a lively controversy exists about the overall costs and benefits of climate change in particular regions.¹²⁴ And if a large company in the New York emits a large volume of greenhouse gases, is it negligent? Suppose that the costs of emissions abatement would be significant; suppose too that the benefits of emissions abatement, in terms of diminished warming, would be effectively zero. We all understand what it means to drive a car negligently so as to put other drivers and pedestrians at risk, but the claim that driving a (nonhybrid?) car carefully is in fact negligent because of its impact on global warming, and the harm it causes to people living in India, remains dubious. Heating a house, driving a car, running a freezer, taking an airplane—are all these activities negligent? Even though the warming effects of the relevant emissions are essentially nil?

It would be possible to respond that, in fact, negligence has been pervasive. Although the harm caused by each of these activities in isolation is small, the cost of precaution is also often low. For example, Nordhaus calculates that the optimal carbon tax as of 2015 would be about \$35 per ton.¹²⁵ The calculation is based on the external cost of burning a ton of carbon as a consequence of greenhouse gas emissions. We calculate that this \$35 per ton figure translates to about an extra ten cents per gallon of gas.¹²⁶ Thus, using the economic theory of negligence as the failure to take cost-justified precautions, we could conclude that a person is negligent when she drives rather than walking, when the benefit she obtains from driving is less than ten cents per gallon consumed. The argument could be extended to the choice of driving rather than using convenient forms of public transportation, and to other activities as well.

Indeed, today, many people seem to be reducing their emissions on the basis of an assessment of roughly this kind. Those concerned about climate change do not seem to believe that they should stop engaging in activities that produce greenhouse gases; instead, they think that they should cut back on activities that generate unreasonable greenhouse gases in light of whatever benefits they produce. Some people go farther and purchase carbon offsets, but this type of activity seems, at present, supererogatory, whereas a case could be made today that a reasonable cutting back on greenhouse-gas emitting activities is morally required—that it represents an emerging community standard or norm.

¹²³ One commentator suggests 1990 as a date for when emitting activities could have become negligent. See Pan, *supra* note, at 3-7.

¹²⁴ See Lomborg, *supra* note.

¹²⁵ Nordhaus, Stern Review, *supra*, at 32.

¹²⁶ See Nordhaus, *The Challenge*, *supra* at 66; Emission Facts: Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel (available at : <http://epa.gov/oms/climate/420f05001.htm>). The figures in the text are very rough and are used for illustration only: what we say would be true even if the numbers are higher or lower, as long as they are not zero.

Even if this is so, there is a significant problem with this argument, which is that the calculation given above assumes that everyone around the world is paying the carbon tax, and thus also cutting back on greenhouse-gas producing activities. If many or most people fail to pay the carbon tax, or (as we argue) fail to act as if they pay it by cutting back on less important greenhouse-gas producing activities, then the contribution of Americans who do this is close to nil. And if this is the case, it cannot be considered negligent for Americans to fail to engage in cutbacks of greenhouse-gas emitting activities. Put differently, it is not negligent to fail to contribute to a public good if not enough others are doing similarly, so that the public good would not be created even if one did contribute.¹²⁷ This is a “moral collective action problem,”¹²⁸ and however it should be assessed, the failure to act when other people are not acting does not seem to constitute negligence.

2. *Negligent government?* What about the U.S. government? Perhaps one could argue that U.S. climate change policy—which is to say not much in the way of policy¹²⁹—has been culpably negligent. The argument would be that, by failing to take precautions that would have cost the U.S. a lot but benefited the rest of the world much more, the U.S. government engaged in culpable behavior.

The problem with this argument is that, as we noted above, there is probably no action that the United States could have taken unilaterally that would have created benefits for the rest of the world greater than the cost to the United States. Unilateral reductions in greenhouse gas emissions would have little effect on overall climate change—not so far from zero even if aggressive and effective, and zero or very close to it if industry simply migrated to foreign countries. The Kyoto Protocol imposed no obligations on China, now the biggest emitter, and placed heavy burdens on the United States.¹³⁰ In this light, the claim that American policy has been negligent, under prevailing legal standards, is far-fetched.

Nothing that we have said is inconsistent with the view that American policy has been wrong or misdirected -- especially insofar as the United States has not sought to engage the world in reducing the problem.¹³¹ But it is not easy to say that the benefits of significant unilateral reductions would clearly exceed the costs.¹³²

3. *The government vs. the public.* Even if one could conclude that the U.S. government behaved negligently, it does not clearly follow that the American people

¹²⁷ Matthew Adler makes this point in criticizing Farber’s corrective justice argument (see Farber, *supra*). See Matthew Adler, *Corrective Justice and Liability for Global Warming*, unpub. m.s. 2007. However, we disagree with Adler’s argument that corrective justice can justify government-to-government claims for reasons given below.

¹²⁸ See *id.*

¹²⁹ For an overview, see Cass R. Sunstein, *Worst-Case Scenarios* (2007).

¹³⁰ See Nordhaus and Boyer, *supra* note.

¹³¹ A vigorous argument in favor of such engagement can be found in Stewart and Wiener, *supra* note.

¹³² See Cass R. Sunstein, *The Complex Climate Change Incentives of China and the United States* (unpublished manuscript 2007).

should be held responsible for their government's failures. The government itself does not have its own money to pay the remedy; it can only tax Americans. To justify such a tax, one would need to conclude that Americans behaved culpably by tolerating a government that failed to take actions that might have conferred benefits on the rest of the world of greater value than their costs.

There is a strong instinct to blame the public for the failures of their political system, but this instinct should be resisted. The last example of such a policy was the war guilt clause of the Versailles Treaty, which held Germany formally responsible for World War I, and required Germany to pay massive reparations to France and other countries. Germans resented this clause and conventional wisdom holds that their resentment fed the rise of Nazism. After World War II, the strategy shifted; rather than holding "Germany" responsible for World War II, the allies sought to hold the individuals responsible for German policy responsible—during trials held at Nuremberg and elsewhere, where defendants were given a chance to defend themselves. The shift from collective to individual responsibility was a major legacy of World War II, reflected today in the proliferation of international criminal tribunals that try individuals, not nations.

To be sure, no one is accusing the American government or its citizens of committing crimes. But the question remains whether Americans should be blamed, in corrective justice terms, for allowing their government to do so little about greenhouse gas emissions. It is one thing to blame individual Americans for excessive greenhouse-gas emissions; it is quite another to blame Americans for the failure of their government to adopt strict greenhouse-gas reduction policies. It is certainly plausible to think that voting for politicians who adopt bad policies, or failing to vote for politicians who adopt good policies, is not morally wrong except in extreme cases. Recall in this connection that even if Americans had demanded that their government act to reduce greenhouse gas emissions in the United States, the effect of unilateral reductions on climate change would be very small.

G. The Institutional Diversion Problem

Corrective justice requires that the wrongdoer make the victim whole; if that is not possible, at least some kind of payment or gesture or action (such as an apology) is required. Between persons, the requirement of remedy is straightforward. Between entities or states, there are serious complications.

The problem is that providing a remedy to a state almost always involves providing a remedy to a government, and a government may not use the benefit received in a manner that compensates the actual victims. Many governments are not democratic, and it is reasonable to assume that such governments do not act in a manner that advances the interest of the public as a whole, as opposed to the interests of a clique or group or tribe. Some other governments, even if democratic in name, are corrupt or ineffective.

Development aid is frequently siphoned off, and has generally had disappointing results.¹³³

Return once more to the example of Serbia and Bosnia. Bosnia is a deeply divided country, split three ways among groups that had been trying to kill each other just fifteen years ago—Bosniaks, Croats, and Serbs—and controlled by a weak government overseen by an ad hoc international agency.¹³⁴ It is possible but not particularly likely that if reparations had been paid by Serbia, they would have been used to benefit the victims of the genocide (mainly Bosnians).

The problem is admittedly less severe in the context of climate change, for one might argue that if the remedy for past greenhouse gas emissions is an obligation to engage in a significant abatement program, the danger of institutional diversion is nil. Citizens of poor nations benefit directly from the cutback on greenhouse gas emissions, and their government cannot siphon off any of these benefits. This point is powerful and may in the end be right, but there remain countervailing considerations. If citizens of a developing nation do benefit from the cutback of greenhouse gas emissions, then they will have more resources and their government can tax them more; and if the government is corrupt, it can squander the wealth. Even in the context of climate change, the institutional diversion problem cannot be entirely evaded.

G. Remedies and Rough Justice

The analogy to the Bosnia-Serbia conflict might seem misleading because the remedy in that case would have been a lump-sum transfer, whereas the remedy urged on the United States would be aggressive abatement of greenhouse gas-emitting activities, or payment of a large share of the cost of such abatement. An abatement program would incur costs today, but the benefits would be directed at the future, and would go directly to those people who would otherwise be harmed by climate change.

Put differently, we might think of the remedy in question as being analogous to an injunction as opposed to damages. When a factory generates pollution, a court might enjoin it from continuing to operate, and in this way provide a benefit to the future—preventing people from becoming victims in the first place. Despite its forward orientation, this type of activity seems consistent with norms of corrective justice, or perhaps we should just say justice in general. Rather than compensating victims of an injury, the agent in question refrains from imposing the injury in the first place.

On reflection, however, these points are less persuasive than they first appear, at least in the particular context of climate change. Recall that greenhouse gas abatement by the United States benefits no one at all unless other countries restrict emissions as well. So it cannot be the case that the United States has an absolute obligation to cut back on emissions. The analogy to a factory that emits pollution is a misleading one, as is the

¹³³ See, e.g., Easterly, *supra* note.

¹³⁴ See Anna Morawiec Mansfield, *Ethnic but Equal: The Quest for a New Democratic Order in Bosnia and Herzegovina*, 103 *Columbia L. Rev.* 2052, 2054 (2003).

analogy to a country that unjustly invades another. In these cases, a harm occurs independently of the actions of others. And if China and other large countries such as India refuse to cut emissions significantly, as seems likely for the foreseeable future, then even a treaty among developed countries is likely to have relatively little benefit.¹³⁵ Justice does not require an agent to curtail activity when doing so benefits no one else and is not wrongful on other grounds.

* * *

However appealing, corrective justice intuitions turn out to be a poor fit with the climate change problem—where the dispute is between nations, and where an extremely long period of time must elapse before the activity in question generates a harm. This is not to say that a corrective justice argument cannot be cobbled together and presented as the basis of a kind of rough justice in an imperfect world.¹³⁶ But such an argument would rely heavily on notions of collective responsibility that are not easy to defend or even to understand. Most of the attractiveness of the corrective justice argument derives, we suspect, from suppressed redistributive and welfarist assumptions, or from collectivist habits of thinking that do not survive scrutiny.

Here too, the argument has general implications. It is often tempting to invoke principles of corrective justice to ask one nation to compensate another. But especially when long periods of time have passed since the initial wrongdoing, the corrective justice argument runs into serious problems, and it is probably better to think in terms of redistribution or welfare.

V. Per Capita Emissions

We turn now to an especially pressing issue of climate change justice, one that is likely to play an increasing role in the next decade and beyond. Along with other developing nation, China has urged that the analysis ought to focus on a nation's per capita emissions, not its aggregate emissions.¹³⁷ This argument might even be connected with a general "right to development," on the theory that a worldwide carbon tax (for example) would forbid poor nations from achieving the levels of development already attained by wealthy nations.¹³⁸ Perhaps an imaginable climate change agreement, one that would actually be effective and efficient, would violate the "right to development."

¹³⁵ See *supra*.

¹³⁶ Cf. Adrian Vermeule, *Reparations As Rough Justice*, unpublished m.s. 2005 (available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=813086).

¹³⁷ See China's National Climate Change Programme, *supra* note, at 58.

¹³⁸ China has made just this argument. See Geoffrey York, Citing "Right To Development," China Rejects Emission Cap, *Globe and Mail*, June 5, 2007, at A1. The UN General Assembly declared the existence of a right to development in 1986. See United Nations General Assembly, Declaration on the Right to Development, Resolution 41/128 (1986).

A. Facts

With respect to China, the factual predicate for this argument is that China's population is the largest on the planet, and notwithstanding its explosive emissions growth, its per capita emissions remain well below those of many nations. Consider the following:

Table 6
*Tons of CO2 Emitted Per Capita in 2004*¹³⁹

United States	19.73
Russia	10.63
Germany	10.29
Japan	9.52
United Kingdom	8.98
EU-25	8.46
Ukraine	6.42
France	6.22
China	3.66
India	1.02

China might well urge that its low per capita emissions rate – not only below that of the United States, but below such nations as Japan, India, Russia, Germany, the United Kingdom, and Ukraine as well – should be taken into account in deciding on appropriate policy. To clarify the claim, assume that the world consists of only two nations, one with two billion people and one with one million people. Suppose that the two nations have the same aggregate emissions rate. Would it make sense to say that the two should be allocated the same level of emissions rights, for purposes of a system of cap-and-trade? Intuition suggests not; and China therefore argues that all citizens should have a right to the same level of opportunity, which means that emissions rights should be allocated on a per-capita basis.¹⁴⁰

B. A Little Doublespeak? Of “Common But Differentiated Responsibilities”

China's argument for taking account of per-capita emissions is captured by its support for and understanding of the United Nations Framework Convention on Climate Change's principle of “common but differentiated responsibilities.”¹⁴¹ On the surface, this principle means that a nation's obligations on climate issues are to be determined by two factors: its responsibility for climate change and its capacity to cut emissions.¹⁴²

¹³⁹ Energy-related CO2 emissions only. See International Energy Agency, *supra* note, at II.49-II. 51.

¹⁴⁰ See Ying Chen and Jiahua Pan, *Equity Concerns over Climate Change Mitigation* (Chinese Academy of Social Sciences, Global Change and Economic Development Program Working Paper No. 002).

¹⁴¹ China's National Climate Change Programme, *supra* note, at 58.

¹⁴² See Pan, *supra* note, at 3-4; Stone, *supra*

Beneath the surface, the principle means that the developed nations have to spend a great deal to reduce their emissions, while the developing nations do not.

Invoking this principle, Chinese officials have called on developed countries to take the lead in cutting their emissions, and have argued that developing countries such as China are bound only to take account of environmental issues as they continue to ensure that their economies grow.¹⁴³ Chinese officials insist that raising the standard of living for their citizens is their first priority.¹⁴⁴ With this point in mind, China has emphasized that any actions it takes in regard to climate change will be “within its capability based on its actual situation.”¹⁴⁵

China further argues that developed countries have an obligation to assist the developing world with the challenges of climate change, both through technology transfer to allow sustainable development and also through financial assistance for adaptation to the effects of global warming.¹⁴⁶ This moral obligation, China argues, arises because the developed world bears the greatest share of responsibility for climate change.¹⁴⁷ Since developed countries appropriated more than their share of “climate resources” in the past, they should now use their wealth to help poor countries develop in a world where warmer climates are a serious threat.¹⁴⁸

C. A (Mildly) Disguised Claim for Cross-National Redistribution

Some of these arguments have considerable intuitive appeal. But to the extent that China’s claim is that emissions rights should be allocated on a per capita basis, China is asking for massive redistribution from the developed nations, above all the United States, to the developing nations, above all China, and it is most puzzling to suggest that the redistribution should occur in the context of climate change policy.

To see the point, we need to distinguish between greenhouse gas taxes and cap-and-trade program. A uniform greenhouse gas tax has a great deal to recommend it¹⁴⁹; and if the tax is uniform, nations and their citizens will in an important sense be treated the same, regardless of their per capita rates. Would it make any sense to suggest that the tax should be (say) \$10 per ton in developing nations, and \$1 in nations with low per capita emissions rates? Such a tax scheme would have some distributive benefits, to be sure; but for reasons that we have explored, it would be better to produce those benefits directly.

¹⁴³ Liu Jiang, Vice-Chairman, National Development and Reform Commission of China, Keynote Speech on the Round Table Meeting of Energy and Environment Ministers from Twenty Nations (2005) (available <http://www.ccchina.gov.cn/en/>)

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ See *id.*; China’s National Climate Change Programme, *supra* note, at 60-61.

¹⁴⁷ See *id.* at 2.

¹⁴⁸ See Chen and Pan, *supra* note, at 5-6.

¹⁴⁹ Nordhaus, *supra* note, at 11.

Now turn to cap-and-trade programs. A large challenge for such programs is to decide on the initial allocation of entitlements. An obvious possibility would be to say that all of the major emitters must reduce their emissions by a stated amount from a specified date – by, say, 10% from 1995. Analytically, this approach would be similar to a tax in terms of its distributional consequences; both take existing emissions rates as the starting point. An alternative possibility, based on per capita rates, would be to say that each nation has a right to emit a specified amount per person. On this approach, United States (with 300 million people) would have less than 30 percent of the emissions rights of India and China (each of which has over one billion people). Such an approach would represent a massive transfer of resources from the United States to other nations – indeed, the transfer would be worth hundreds of billions of dollars.

There is no sign that the United States wants to give hundreds of billions of dollars to China or India. Indeed, any proposal that it should do so, in general or in the context of climate change, would be widely unpopular to say the least; domestic political constraints would probably doom any such proposal. And if the United States does decide to give hundreds of billions of dollars to poor nations, why should the gift take the form of emissions rights?

One answer is that the gift would represent a side-payment, designed to ensure that developing nations, above all China, participate in the deal. Such an approach would be very similar to what happened in connection with the Kyoto Protocol, where Russia and Eastern Europe were given side-payments, in the form of emissions rights worth over one hundred billion dollars.¹⁵⁰ (One hundred billion dollars, by the way, is about one-third the total cost of the Kyoto Protocol to the United States, had the United States agreed to the emissions reductions requirements.¹⁵¹) That particular side-payment was understandable, especially for Russia; recall that on prominent projections, Russia would be a net gainer from climate change.¹⁵² The question is whether the United States, which has comparatively less to lose from climate change, is willing to give poor countries large sums of money as part of a climate change agreement. It is far more likely that the United States would say: *We would like to be subsidized, not punished, for our willingness to enter into an agreement that does not appear to be in our interest.*

There are other problems with the proposal for per capita emissions rights. China's population grew by about eight million people in 2006; the United States' population grew by about three million that same year.¹⁵³ If China's proposal were in place, then presumably China's entitlement would increase relative to America's. Many if not most of China's new inhabitants would produce very little in the way of greenhouse gas: they will be poor farmers tilling the fields. Thus, the increase in entitlements would be enjoyed by China's relatively wealthy urban population.

¹⁵⁰ Nordhaus and Boyer, *supra* note.

¹⁵¹ *Id.*

¹⁵² See *id.* at 191.

¹⁵³ U.S. Census Bureau International Data Base (IDB), available at <http://www.census.gov/ipc/www/idb>.

At the same time, countries would be given an incentive—or at least no disincentive—to increase their populations. Perhaps it would be better if governments took account of greenhouse gas effects when determining population policy. In any event, a sensible climate control agreement would require countries to pay for their greenhouse gas emissions regardless of how large or small their populations. If China demands or deserves a side payment, that is a separate question, not to be confounded by reference to per capita emissions rights. As we have seen, developing nations, including China, were given a set of side-payments in connection with the Montreal Protocol, and China may well demand such payments in the context of climate change.¹⁵⁴

A few final points should be stressed about practicalities and politics. If China must be paid to reduce greenhouse gas emissions, then probably most of the developing world will also have to be paid to reduce greenhouse gas emissions. This step would significantly increase the effective carbon tax that would be paid by developed countries. It would also be necessary to obtain a commitment from the payees that they not further develop greenhouse-gas emitting industries just to increase their bargaining power for future renegotiations—and this could be extremely difficult. And if the United States refuses to pay more than the carbon tax than is optimal for it, and thus underpays relative to the global optimum, then we could face a situation where other rich nations (and not inconceivably even poor nations) could offer to pay the United States to reduce its greenhouse gas emissions—at the least, an offer that would be politically delicate.

Conclusion

It is increasingly clear that an international agreement to control climate change would be in the world's interest.¹⁵⁵ Either a worldwide carbon tax¹⁵⁶ or some kind of cap-and-trade program¹⁵⁷ would be suitable for the purpose. But the agreement that is optimal for the world may not be optimal for the United States, which would have to bear a large burden for significant emissions reductions and which is not among the nations most gravely threatened by climate change. In addition, there are important questions about how to distribute the costs of emissions reductions. Many people believe that because the United States is wealthy, and because it has contributed a great deal to the existing stock of emissions, it should bear a large share of the cost. As we have seen, the United States would have borne the lion's share of the cost of the Kyoto Protocol, if it had agreed to the relevant emissions restrictions; indeed, the cost to the United States might have been as high as 80 percent of the total cost.¹⁵⁸

The distributive argument must be separated from the corrective justice argument. If the United States wants to use its wealth to help to protect India and Africa or the

¹⁵⁴ See Olmstead and Stavins, *supra* note.

¹⁵⁵ The best discussion is Nordhaus, *supra* note.

¹⁵⁶ A carbon tax is vigorously defended in *id.*

¹⁵⁷ A cap-and-trade program is vigorously defended in Stewart and Wiener, *supra* note, at 65-79.

¹⁵⁸ See *id.* at 10. Nordhaus estimates that the United States would have borne about two-thirds of the cost. See William Nordhaus, *After Kyoto: Alternative Mechanisms to Control Global Warming* 24 (2002), available at http://www.econ.yale.edu/~nordhaus/homepage/PostKyoto_v4.pdf

world from climate change, there can be no reason for complaint – just as there could be no reason for complaint if the United States used its wealth to help to protect India and Africa or some other region from an asteroid or a tsunami. It is far from clear, however, that greenhouse gas restrictions on the part of the United States are the best way to help the most disadvantaged citizens of the world.¹⁵⁹

Many people are treating climate change as a kind of tort, committed by the United States against those who are most vulnerable.¹⁶⁰ But we have seen that principles of corrective justice have an awkward relationship to the problem of climate change. Many of the relevant actors are long dead, and a general transfer from the United States to those in places especially threatened by climate change is not an apt way of restoring some imagined status quo. In this context, the idea of corrective justice is a metaphor, and a highly imperfect one.

We have not attempted here to devise any particular program for dealing with greenhouse gas emissions.¹⁶¹ If the United States agrees to participate in a climate change agreement on terms that are not in the nation's interest, but that help the world as a whole, there would be no reason for complaint, certainly if such participation is more helpful to poor nations than conventional foreign-aid alternative. Compared to continued inaction, participation on those terms would be entirely commendable. But the commendation should not be muddled by resort to crude and unhelpful arguments from distributive and corrective justice. Our goal here has been to clarify the uses and limits of those arguments, in a way that bears not only on climate change, but also on a wide range of other questions raised when some nations make claims on others.

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¹⁵⁹ See various contributions to Global Problems, Global Solutions, *supra* note.

¹⁶⁰ See note *supra*.

¹⁶¹ Sensible approaches can be found in Stewart and Wiener, *supra* note, and Nordhaus, *supra* note.

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